```
=> s carbon foam
   1141634 CARBON
     25132 CARBONS
   1150682 CARBON
             (CARBON OR CARBONS)
     98683 FOAM
     56724 FOAMS
    109856 FOAM
             (FOAM OR FOAMS)
L1     384 CARBON FOAM
             (CARBON(W)FOAM)

=> s l1 and (lead acid battery)
    577532 LEAD
    272002 LEADS
    830252 LEAD
             (LEAD OR LEADS)
   4030191 ACID
   1490906 ACIDS
   4512200 ACID
             (ACID OR ACIDS)
    116743 BATTERY
     92068 BATTERIES
    126827 BATTERY
             (BATTERY OR BATTERIES)
      7658 LEAD ACID BATTERY
             (LEAD(W)ACID(W)BATTERY)
L2        2 L1 AND (LEAD ACID BATTERY)

=> d l2 abs ibib 1-2

L2   ANSWER 1 OF 2  CAPLUS  COPYRIGHT 2005 ACS on STN
AB   A battery cell includes a neg. current collector and at least one
     carbon foam pos. current collector disposed within the
     cell such that the neg. current collector at least partially surrounds the
     at least one carbon foam pos. current collector.  An
     insulating mat is disposed between the neg. current collector and the at
     least one carbon foam pos. current collector.
ACCESSION NUMBER:         2004:513096  CAPLUS
DOCUMENT NUMBER:          141:40778
TITLE:                    Battery having carbon foam current
                          collector
INVENTOR(S):              Kelley, Kurtis C.; Ostermeier, Charles F.; Maroon,
                          Matthew J.
PATENT ASSIGNEE(S):       USA
SOURCE:                   U.S. Pat. Appl. Publ., 9 pp.
                          CODEN: USXXCO
DOCUMENT TYPE:            Patent
LANGUAGE:                 English
FAMILY ACC. NUM. COUNT:   1
PATENT INFORMATION:

     PATENT NO.           KIND   DATE        APPLICATION NO.         DATE
     ---------------      ----   --------    --------------------    --------
     US 2004121238         A1    20040624    US 2002-326257          20021223
PRIORITY APPLN. INFO.:                       US 2002-326257          20021223

L2   ANSWER 2 OF 2  CAPLUS  COPYRIGHT 2005 ACS on STN
AB   A battery has a current collector constructed of carbon
     foam.  The carbon foam includes a network of
     pores into which a chemical active paste is disposed to create either a pos.
     or neg. plate for the battery.  The carbon foam
     resists corrosion and exhibits a large amount of surface area.  The
     invention includes a method for making the disclosed carbon
     foam current collector used in the battery.
ACCESSION NUMBER:         2004:3546  CAPLUS
DOCUMENT NUMBER:          140:44769
TITLE:                    Battery including carbon foam
```

current collectors

INVENTOR(S): Kelley, Kurtis Chad; Votoupal, John J.

PATENT ASSIGNEE(S): Caterpillar Inc., USA

SOURCE: U.S. Pat. Appl. Publ., 10 pp.
CODEN: USXXCO

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| US 2004002006 | A1 | 20040101 | US 2002-183471 | 20020628 |
| CA 2489953 | AA | 20040108 | CA 2003-2489953 | 20030522 |
| WO 2004004027 | A2 | 20040108 | WO 2003-US16262 | 20030522 |
| WO 2004004027 | A3 | 20040610 | | |
| W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW | | | | |
| RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG | | | | |
| EP 1518293 | A2 | 20050330 | EP 2003-761909 | 20030522 |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK | | | | |
| US 2004191632 | A1 | 20040930 | US 2004-798875 | 20040312 |
| US 2005191555 | A1 | 20050901 | US 2005-98458 | 20050405 |

PRIORITY APPLN. INFO.:

| | | |
|---|---|---|
| US 2002-183471 | A | 20020628 |
| WO 2003-US16262 | W | 20030522 |
| US 2004-798875 | A3 | 20040312 |

=> d l2 abs ibib 1-35

L2 ANSWER 1 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN

AB Coal based **carbon foams** that are produced by the controlled beating of coal particulate in a mold and under a non-oxidizing atmospheric and subsequently graphitized have been found to provide excellent **electrode** materials for electrochem. cell applications.

ACCESSION NUMBER: 2005:468599 CAPLUS
DOCUMENT NUMBER: 143:10544
TITLE: Electrochemical cell **electrodes** comprising coal-based **carbon foam**
INVENTOR(S): Rogers, Darren K.; Plucinski, Janusz Wladyslaw
PATENT ASSIGNEE(S): Touchstone Research Laboratory, Ltd., USA
SOURCE: U.S., 36 pp.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| US 6899970 | B1 | 20050531 | US 2001-888977 | 20010625 |

PRIORITY APPLN. INFO.: US 2001-888977 20010625
REFERENCE COUNT: 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 2 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN

AB The aim of the current study is to determine the feasibility of introducing fuel cell functionality on the surfaces of carbon-based composite materials. This can potentially be achieved by the synthesis of molybdenum carbides on the surfaces of carbon foam, which is a light and rigid material that can be used as structural components in aircrafts and vehicles. The current study employed phys. vapor deposition (PVD) to deposit molybdenum on the carbon foam substrate. The ratio of surface molybdenum and surface carbon was determined using XPS. The combination of PVD and in situ XPS allowed for the synthesis of molybdenum-coated carbon foam samples with desirable and reproducible Mo/C ratios. The coated films were then heated in vacuum to promote the reaction between molybdenum and carbon foam to produce surface molybdenum carbides. The carbide-coated samples were further characterized using XPS, near-edge x-ray absorption fine structure (NEXAFS), and SEM. Platinum metal was also deposited via PVD on carbon foam, both with and without the presence of molybdenum carbide on the foam surface. The electrochem. stability of Pt-coated foams was evaluated using cyclic voltammetry (CV).

ACCESSION NUMBER: 2005:223617 CAPLUS
DOCUMENT NUMBER: 142:449328
TITLE: Multifunctional composites containing molybdenum carbides as potential electrocatalysts
AUTHOR(S): Weigert, Erich C.; South, Joseph; Rykov, Sergey A.; Chen, Jingguang G.
CORPORATE SOURCE: Center for Catalytic Science and Technology, Department of Materials Science and Engineering, University of Delaware, Newark, DE, 19716, USA
SOURCE: Catalysis Today (2005), 99(3-4), 285-290
CODEN: CATTEA; ISSN: 0920-5861
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English
REFERENCE COUNT: 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 3 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN

AB Composite **electrodes** used for electrochem. capacitors were fabricated by electrochem. polymerization of 3(4-fluorophenyl)-thiophene onto **carbon foam** in 0.2 mol/L tetraethylammonium tetrafluoroborate (Et4NBF4) acetonitrile solns. or in 0.2 mol/L tetramethylammonium trifluoromethanesulfonate (Me4NSO3CF3) acetonitrile

solns. Cyclic voltammetry (CV), FTIR and SEM were used to characterize the composite **electrodes**. There are two mechanisms of storing elec. energy for the composite **electrodes**: one is pseudocapacitance resulted from PFPT, and the other is double layer capacitance resulted from porous structure of the composite **electrodes**. The prototype electrochem. capacitor was assembled with two pieces of composite **electrodes** with electrolyte of 0.2 mol/L Et4NBF4 acetonitrile solns. or 0.2 mol/L Me4NSO3CF3 acetonitrile solns., and tested by chronopotentiometry. Calculated on total mass of the **electrodes**, energy d. of the electrochem. capacitor can reach 4.2 Wh/kg, and power d. can reach 683 W/kg in 0.2 mol/L Me4NSO3CF3 acetonitrile solns.

ACCESSION NUMBER: 2004:841024 CAPLUS
DOCUMENT NUMBER: 143:164395
TITLE: PFPT/**carbon foam** composite **electrodes** used for electrochemical capacitors
AUTHOR(S): Zhang, Qing-wu; Zhou, Xiao
CORPORATE SOURCE: Department of Chemical Engineering, Tsinghua University, Beijing, 100084, Peop. Rep. China
SOURCE: Dianyuan Jishu (2004), 28(8), 487-490
CODEN: DIJIFT; ISSN: 1002-087X
PUBLISHER: Dianyuan Jishu Bianjibu
DOCUMENT TYPE: Journal
LANGUAGE: Chinese

L2 ANSWER 4 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN

AB A battery has a **current collector** constructed of **carbon foam**. The **carbon foam** includes a network of pores into which a chemical active material is disposed to create either a pos. or neg. plate for the battery. The **carbon foam** resists corrosion and exhibits a large amount of surface area. The invention includes a method for making the disclosed **carbon foam current collector** used in the battery.

ACCESSION NUMBER: 2004:802391 CAPLUS
DOCUMENT NUMBER: 141:280432
TITLE: Battery including **carbon foam current collectors**
INVENTOR(S): Kelley, Kurtis Chad; Votoupal, John J.
PATENT ASSIGNEE(S): USA
SOURCE: U.S. Pat. Appl. Publ., 11 pp., Cont.-in-part of U.S. Ser. No. 183,471.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| US 2004191632 | A1 | 20040930 | US 2004-798875 | 20040312 |
| US 2004002006 | A1 | 20040101 | US 2002-183471 | 20020628 |
| US 2005191555 | A1 | 20050901 | US 2005-98458 | 20050405 |
| PRIORITY APPLN. INFO.: | | | US 2002-183471 A2 | 20020628 |
| | | | US 2004-798875 A3 | 20040312 |

L2 ANSWER 5 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN

AB Pt-containing alloys are used as electrocatalysts in fuel cells. The disadvantage of these Pt alloys are their scarcity and high cost. In the case of functionalized carbon foam, it is not economically feasible to simply coat the foam surfaces with Pt - another approach is necessary. Accordingly, molybdenum carbides and platinum-modified molybdenum carbides were studied as potential electrocatalysts for DMFC's. The formation of molybdenum carbides on the surface of carbon foam substrates was confirmed by XPS and NEXAFS. CV measurements on Pt/foam and Pt/MoC/foam indicate an increase in the electrocatalytic activity when the carbon foam surface is functionalized with Pt and Pt/MoC.

ACCESSION NUMBER: 2004:665643 CAPLUS
DOCUMENT NUMBER: 141:382028

TITLE: Multifunctional composites containing molybdenum carbides as potential electrocatalysts
AUTHOR(S): Weigert, Erich C.; South, Joseph; Chen, Jingguang G.
CORPORATE SOURCE: Center for Catalytic Science and Technology, Department of Materials Science and Engineering, University of Delaware, Newark, DE, 19716, USA
SOURCE: Preprints of Symposia - American Chemical Society, Division of Fuel Chemistry (2004), 49(2), 675-676
CODEN: PSADFZ; ISSN: 1521-4648
PUBLISHER: American Chemical Society, Division of Fuel Chemistry
DOCUMENT TYPE: Journal; (computer optical disk)
LANGUAGE: English
REFERENCE COUNT: 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 6 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB The authors studied prepared a high surface area carbon material through a bis-ortho-diynylarene (BODA) templating method which can then be functionalized with both well dispersed platinum nanoparticles, to act as catalysts, and fluorophilic groups to facilitate the compatibility of the membrane and electrodes in the MEA of a fuel cell. The bis(phenyl) derivative monomers proceed to a polymerized bis(naphthalene) derivative ladder polymer network, melted and introduced to a silica template, and are then carbonized to glassy carbon. Silica is removed and a porous carbonaceous foam remains. Platinum and fluorine were incorporated by various methods.
ACCESSION NUMBER: 2004:665639 CAPLUS
DOCUMENT NUMBER: 142:41313
TITLE: Functionalized nanostructure d carbons for fuel cell electrodes
AUTHOR(S): Perpall, Mark W.; Shaban, Ibrahim; Mei, Hua; Creager, Stephen E.; Desmarteau, Darryl D.; Smith, Dennis W., Jr.
CORPORATE SOURCE: Department of Chemistry, Clemson University, Clemson, SC, 29678, USA
SOURCE: Preprints of Symposia - American Chemical Society, Division of Fuel Chemistry (2004), 49(2), 666-667
CODEN: PSADFZ; ISSN: 1521-4648
PUBLISHER: American Chemical Society, Division of Fuel Chemistry
DOCUMENT TYPE: Journal; (computer optical disk)
LANGUAGE: English
REFERENCE COUNT: 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 7 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB Uniform-sized mesoporous carbons having high surface areas and various structures were synthesized directly by the carbonization of P123 triblock copolymer/phenol-resin/silica nanocomposites, which were prepared from the sol-gel polymerization of silica in the presence of Pluronic P123 triblock copolymer and phenol and subsequent silica removal. Mesoporous carbon, with uniform 5.6 nm wormhole-like pores, was synthesized using sodium silicate as a silica source. When the amount of phenol relative to block copolymer was reduced in the synthesis, mesocellular **carbon foams** with bimodal pore structures were obtained. In addition, mesoporous carbons were synthesized using TEOS (tetra-Et orthosilicate) as a silica source. The pore size of the mesoporous carbons was controlled by varying the ratio of phenol and P123 triblock copolymer. At an optimal molar ratio of phenol to block copolymer, mesoporous carbon with a nanofiber morphol. was obtained. The mesoporous carbons were successfully used as the **electrodes** for electrochem. double-layer capacitors.
ACCESSION NUMBER: 2004:587397 CAPLUS
DOCUMENT NUMBER: 141:264440
TITLE: Simple Synthesis of Uniform Mesoporous Carbons with Diverse Structures from Mesostructured Polymer/Silica Nanocomposites
AUTHOR(S): Lee, Jinwoo; Kim, Jaeyun; Lee, Youjin; Yoon, Songhun; Oh, Seung M.; Hyeon, Taeghwan
CORPORATE SOURCE: National Creative Research Initiative Center for Oxide Nanocrystalline Materials, Research Center for Energy

Conversion and Storage (RCECS) and School of Chemical Engineering, Seoul National University, Seoul, 151-744, S. Korea
SOURCE: Chemistry of Materials (2004), 16(17), 3323-3330
CODEN: CMATEX; ISSN: 0897-4756
PUBLISHER: American Chemical Society
DOCUMENT TYPE: Journal
LANGUAGE: English
REFERENCE COUNT: 41 THERE ARE 41 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 8 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB A battery cell includes a neg. **current collector** and at least one **carbon foam** pos. **current collector** disposed within the cell such that the neg. **current collector** at least partially surrounds the at least one **carbon foam** pos. **current collector**. An insulating mat is disposed between the neg. **current collector** and the at least one **carbon foam** pos. **current collector**.
ACCESSION NUMBER: 2004:513096 CAPLUS
DOCUMENT NUMBER: 141:40778
TITLE: Battery having **carbon foam current collector**
INVENTOR(S): Kelley, Kurtis C.; Ostermeier, Charles F.; Maroon, Matthew J.
PATENT ASSIGNEE(S): USA
SOURCE: U.S. Pat. Appl. Publ., 9 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| US 2004121238 | A1 | 20040624 | US 2002-326257 | 20021223 |
| PRIORITY APPLN. INFO.: | | | US 2002-326257 | 20021223 |

L2 ANSWER 9 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB The invention concerns a foam containing ≥70% of carbon and having a middle cell size over 20 μm, a porosity 35-99.5%, as well as open-cell character over 90%, an internal surface over 50 m2/g with cell walls referred to this cell size which contain in the cross section a triangle, and pores in the cell scaffolding material with dimensions from 0.2 nm to 50 nm and a volume 0.01-0.8 cm3/g. The procedure for producing this foam is based on pyrolysis of synthetic foams, whereby the assigned plastics foam materials (e.g., urea-formaldehyde copolymer or melamine-formaldehyde copolymer) possess at least 30% of a polymer (e.g., polyisocyanate) with a nitrogen content over 6% and a porosity 35-995%, as well as an open-cell character >1%. The pyrolysis is carried out with steam, carbon dioxide, and/or oxygen at ≥400-1200°. The pyrolyzed plastics foam materials may comprise an inorg. component such as aqueous dispersion of an inorg. salt (e.g. ZnCl2, CaCO3, or ammonium polyphosphate), metal powder, or graphite. The resulting **carbon foam** is suitable for filters, thermal insulators, carriers, or semi-product for further processing in **electrodes**, superconductors, or fuel cell materials.
ACCESSION NUMBER: 2004:249212 CAPLUS
DOCUMENT NUMBER: 140:274741
TITLE: Manufacture of carbon composed foams with high internal surface by pyrolysis of N-containing polymers
INVENTOR(S): Rotermund, Udo; Hempel, Renate; Hesse, Michael; Rudloff, Jan; Desseix, Maryline
PATENT ASSIGNEE(S): BASF AG, Germany
SOURCE: Ger. Offen., 17 pp.
CODEN: GWXXBX
DOCUMENT TYPE: Patent

LANGUAGE: German
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| DE 10243240 | A1 | 20040325 | DE 2002-10243240 | 20020917 |
| WO 2004026792 | A1 | 20040401 | WO 2003-EP9943 | 20030908 |
| W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW | | | | |
| RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG | | | | |
| EP 1542941 | A1 | 20050622 | EP 2003-797284 | 20030908 |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK | | | | |

PRIORITY APPLN. INFO.: DE 2002-10243240 A 20020917
WO 2003-EP9943 W 20030908

L2 ANSWER 10 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN

AB A battery has a **current collector** constructed of **carbon foam**. The **carbon foam** includes a network of pores into which a chemical active paste is disposed to create either a pos. or neg. plate for the battery. The **carbon foam** resists corrosion and exhibits a large amount of surface area. The invention includes a method for making the disclosed **carbon foam current collector** used in the battery.

ACCESSION NUMBER: 2004:3546 CAPLUS
DOCUMENT NUMBER: 140:44769
TITLE: Battery including **carbon foam current collectors**
INVENTOR(S): Kelley, Kurtis Chad; Votoupal, John J.
PATENT ASSIGNEE(S): Caterpillar Inc., USA
SOURCE: U.S. Pat. Appl. Publ., 10 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| US 2004002006 | A1 | 20040101 | US 2002-183471 | 20020628 |
| CA 2489953 | AA | 20040108 | CA 2003-2489953 | 20030522 |
| WO 2004004027 | A2 | 20040108 | WO 2003-US16262 | 20030522 |
| WO 2004004027 | A3 | 20040610 | | |
| W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW | | | | |
| RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG | | | | |
| EP 1518293 | A2 | 20050330 | EP 2003-761909 | 20030522 |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK | | | | |
| US 2004191632 | A1 | 20040930 | US 2004-798875 | 20040312 |
| US 2005191555 | A1 | 20050901 | US 2005-98458 | 20050405 |

PRIORITY APPLN. INFO.: US 2002-183471 A 20020628
WO 2003-US16262 W 20030522

L2 ANSWER 11 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB Polypyrrole/C foam composite electrodes for electrochem. capacitors were fabricated by electrochem. polymerization of pyrrole in aqueous solution on C foam which was prepared by carbonization of poly(acrylonitrile) membranes supported by C papers. The C foams were characterized with FTIR, SEM and the BET technique. The elec. capacitance of the composite electrodes was studied by cyclic voltammetry. Prototypes of the electrochem. capacitors with polypyrrole/C foam electrodes were studied with a.c. impedance spectroscopy and chronopotentiometry. The dependence of sp. power and sp. energy on the conditions of the electrochem. polymerization of pyrrole was studied. Based on total weight of the electrode in a prototype electrochem. capacitor, the energy d. could reach 2.5 W-h/kg. All results showed that polypyrrole/C foam composite materials can be applied in electrochem. capacitors.

ACCESSION NUMBER: 2003:974767 CAPLUS
DOCUMENT NUMBER: 140:149091
TITLE: Capacitance properties of composite **electrodes** prepared by electrochemical polymerization of pyrrole on **carbon foam** in aqueous solution
AUTHOR(S): Zhang, Qing-wu; Zhou, Xiao; Yang, Hong-sheng
CORPORATE SOURCE: Department of Chemical Engineering, Tsinghua University, Beijing, 100084, Peop. Rep. China
SOURCE: Journal of Power Sources (2004), 125(1), 141-147
CODEN: JPSODZ; ISSN: 0378-7753
PUBLISHER: Elsevier Science B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English
REFERENCE COUNT: 22 THERE ARE 22 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 12 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB Porous membranes of polyacrylonitrile were prepared directly on carbon paper with the phase inversion method, and then cross-linked under γ-ray radiation. **Carbon foam** materials were obtained from these cross-linked composite porous membranes after oxidation at 220° in air, carbonization at 850° in nitrogen and activation at 850° in CO2. Morphologies of the **carbon foam** materials were observed with SEM, and the sp. surface area was measured with the Brunauer-Emmett-Teller(BET) technique. The network structure of the **carbon foam** materials was affected by γ-ray radiation, and the BET value could reach a high value of 500 m2/g after treatment with CO2 at 850°. These **carbon foam** materials can be used directly as **electrodes** of electrochem. capacitors in suitable shapes and size. Cyclic voltammetry, a.c. impedance spectrum and galvanic cycles of the **carbon foam electrode** were tested both in aqueous and organic media for evaluating its electrochem. performance. The specific capacitance of such a **carbon foam electrode** in 1 mol/L aqueous solution of sulfuric acid is 174 F/g,which is at the high level of carbon **electrodes**.

ACCESSION NUMBER: 2003:914425 CAPLUS
DOCUMENT NUMBER: 140:208451
TITLE: Carbon foam materials prepared from polyacrylonitrile and their application in electrochemical capacitors
AUTHOR(S): Zhang, Qingwu; Zhou, Xiao; Yang, Hongsheng
CORPORATE SOURCE: Dep. Chem. Eng., Tsinghua Univ., Beijing, 100084, Peop. Rep. China
SOURCE: Gaofenzi Xuebao (2003), (5), 749-753
CODEN: GAXUE9; ISSN: 1000-3304
PUBLISHER: Kexue Chubanshe
DOCUMENT TYPE: Journal
LANGUAGE: Chinese

L2 ANSWER 13 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB The glassy **carbon foams** made of only ribs with protruded parts, are manufactured by (1) reacting polyols with polyisocyanates

to give isocyanate-terminated urethane prepolymers, (2) adding water-soluble or water-suspendable thermosetting resins, water, and optionally fillers, surfactants, dispersants, blowing agents excluding water, catalysts, foam stabilizers, and/or curing agents to the prepolymers, mixing, and expanding, (3) heating the thermosetting resins in the resulting foams for crosslinking to give infusibilized polyurethane foams, and (4) firing the polyurethane foams in an inert gas atmospheric at ≥800°. The glassy **carbon foams** have high porosity, purity, mech. strength, and resistance to heat and chems. and are suitable for filters, catalyst supports, adsorbents, capacitor **electrodes**, thermal insulators, etc.

ACCESSION NUMBER: 2003:685944 CAPLUS
DOCUMENT NUMBER: 139:201144
TITLE: Glassy carbon foams and their manufacture from polyurethane foams
INVENTOR(S): Ishii, Chikara; Kotani, Yoshitsugu
PATENT ASSIGNEE(S): Nisshin Spinning Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 10 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| JP 2003246673 | A2 | 20030902 | JP 2002-50821 | 20020227 |
| PRIORITY APPLN. INFO.: | | | JP 2002-50821 | 20020227 |

L2 ANSWER 14 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB The carbon-based structured materials with controlled topol., morphol. and functionality are prepared by controlled carbonization, or pyrolysis, of precursors comprising phase separated copolymers. The precursor materials are selected to phase sep. and self organize in bulk, in solution, in the presence of phase selective solvents, at surfaces, interfaces or during fabrication, into articles, fibers or films exhibiting well-defined, self-organized morphol. or precursors of well-defined, self-organized, bi- or tri-phasic morphol. Compositional control over the (co)polymers provides control over the structure of the phase separated precursor whose organization therein dictates the nanostructure of the material obtained after carbonization or pyrolysis, wherein each dimension of the formed structure can be predetd. When the precursor morphol. is selected to comprise cylindrical domains this procedure addnl. allows for the direct formation of two dimensional nanowire grids or arrays of oriented nanostructures on surfaces. When these nanowire grids or arrays are perpendicularly oriented to the surface applications include field emitters, high surface area **electrodes**, electronic devices such as diodes and transistors, tools for AMF tips and elements of mol. electronics. When the first nanostructured morphol. is selected to form cylinders parallel to the surface then nanowire arrays are formed after pyrolysis. When the composition of the first nanostructured morphol. is selected to comprise a continuous precursor matrix then a continuous carbon based nanostructured material is formed. The internal structure of the carbon based material can be selected to comprise perpendicular pores or an interconnected array of pores. The carbon based structures can addnl. find application in photovoltaics, supercapacitors, batteries, fuel cells, computer memory, carbon **electrodes**, **carbon foams**, actuators and hydrogen storage.

ACCESSION NUMBER: 2002:793547 CAPLUS
DOCUMENT NUMBER: 137:313078
TITLE: A process for the preparation of nanostructured materials
INVENTOR(S): Kowalewski, Tomasz; Lambeth, David N.; Matyjaszewski, Krzysztof; Spanswick, James; Tsarevsky, Nicolay V.
PATENT ASSIGNEE(S): Carnegie Mellon University, USA
SOURCE: PCT Int. Appl., 103 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent

LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| WO 2002081372 | A2 | 20021017 | WO 2002-US10811 | 20020406 |
| WO 2002081372 | A3 | 20030904 | | |
| W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW | | | | |
| RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG | | | | |
| US 2003185741 | A1 | 20031002 | US 2002-118519 | 20020406 |
| EP 1377519 | A2 | 20040107 | EP 2002-763965 | 20020406 |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR | | | | |
| JP 2005500229 | T2 | 20050106 | JP 2002-579368 | 20020406 |
| PRIORITY APPLN. INFO.: | | | US 2001-282132P P | 20010406 |
| | | | WO 2002-US10811 W | 20020406 |

L2 ANSWER 15 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB A method of making **carbon foam** is disclosed and involves pyrolyzing at least one pyrolyzable material in the presence of a sufficient amount of at least oxidizing source. The pyrolyzable material or its decomposition products may provide the fuel or a sep. fuel can be used. The pyrolyzable material and oxidizing source and optionally a fuel source can be introduced in any order or in any combination. The resulting **carbon foam** made by this process is also described. Furthermore, the **carbon foam** made by this process can be used in a variety of end use applications including **electrodes**, thermal insulation material, polymers, elastomers, and the like.
ACCESSION NUMBER: 2002:754966 CAPLUS
DOCUMENT NUMBER: 137:281431
TITLE: Methods of making carbon foams
INVENTOR(S): Reznek, Steven R.
PATENT ASSIGNEE(S): USA
SOURCE: U.S. Pat. Appl. Publ., 4 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| US 2002141931 | A1 | 20021003 | US 2001-825582 | 20010403 |
| WO 2002081407 | A1 | 20021017 | WO 2002-US10215 | 20020401 |
| W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | | |
| RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG | | | | |
| PRIORITY APPLN. INFO.: | | | US 2001-825582 A | 20010403 |

L2 ANSWER 16 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB Manufacture of a C foam involves (1) manufacture of a polyimide foam and (2) pyrolysis of the polyimide foam at >1,000°. The resulting foam is suitable for manufacture of fuel cells (especially electrode-membrane-electrode

systems).
ACCESSION NUMBER: 2002:198080 CAPLUS
DOCUMENT NUMBER: 136:203042
TITLE: Method for fabricating carbon foam and fuel cell using this foam
INVENTOR(S): Dubois, Jean Claude; Dupont, Marc; Buttin, Daniel; Straumann, Marie
PATENT ASSIGNEE(S): Thomson CSF, Fr.
SOURCE: Fr. Demande, 13 pp.
CODEN: FRXXBL
DOCUMENT TYPE: Patent
LANGUAGE: French
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| FR 2809384 | A1 | 20011130 | FR 2000-6765 | 20000526 |
| FR 2809384 | B1 | 20030411 | | |
| PRIORITY APPLN. INFO.: | | | FR 2000-6765 | 20000526 |

L2 ANSWER 17 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB The manufacture of **carbon foam** is includes pyrolyzing a mixture containing at least one pyrolyzable substance and at least one unpyrolyzable material and then removing the unpyrolyzable material to obtain the **carbon foam**. Said pyrolyzable substance is sugar or cellulose containing coal. The unpyrolyzable material is an inorg. salt such as NaCl. The sugar-to-NaCl ratio is from 10:1 to 5:1. Incorporating the carbon aerogel foam in a variety of end use applications including battery **electrodes**, capacitor **electrodes**, thermal insulation materials, polymers, electrochem. cells, fuel cells, and the like is also described.
ACCESSION NUMBER: 2002:89975 CAPLUS
DOCUMENT NUMBER: 136:155058
TITLE: Manufacture of carbon aerogel foams by pyrolysis of hydrocarbons
INVENTOR(S): Reznek, Steven R.; Massey, Robert K.
PATENT ASSIGNEE(S): Cabot Corporation, USA
SOURCE: PCT Int. Appl., 15 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| WO 2002008151 | A2 | 20020131 | WO 2001-US20585 | 20010628 |
| WO 2002008151 | A3 | 20020530 | | |
| W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | | |
| RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG | | | | |
| US 2002028385 | A1 | 20020307 | US 2001-805264 | 20010313 |
| US 6500401 | B2 | 20021231 | | |
| AU 2001073050 | A5 | 20020205 | AU 2001-73050 | 20010628 |
| EP 1303466 | A2 | 20030423 | EP 2001-952279 | 20010628 |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR | | | | |
| PRIORITY APPLN. INFO.: | | | US 2000-220464P P | 20000720 |
| | | | US 2001-805264 A | 20010313 |
| | | | WO 2001-US20585 W | 20010628 |

L2 ANSWER 18 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN

AB Mesocellular **carbon foams** were fabricated through the carbonization of phenol-resin inside the pores of mesocellular aluminosilicate foam templates, followed by the removal of the templates. The **carbon foams** could be applied to **electrode** materials for super-capacitors, catalyst supports, and adsorbents for bulky water-pollutants.

ACCESSION NUMBER: 2001:315915 CAPLUS
DOCUMENT NUMBER: 135:65131
TITLE: Fabrication of novel mesocellular carbon foams with uniform ultralarge mesopores
AUTHOR(S): Lee, Jinwoo; Sohn, Kwonnam; Hyeon, Taeghwan
CORPORATE SOURCE: School of Chemical Engineering and Institute of Chemical Processes, Seoul National University, Seoul, 151-742, S. Korea
SOURCE: Journal of the American Chemical Society (2001), 123(21), 5146-5147
CODEN: JACSAT; ISSN: 0002-7863
PUBLISHER: American Chemical Society
DOCUMENT TYPE: Journal
LANGUAGE: English
REFERENCE COUNT: 21 THERE ARE 21 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 19 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN

AB A lithium ion battery has at least two **carbon foam electrodes**. Each of the **electrodes** is fitted with a plate formed from an elec. conductive material. The plate has an underside which is formed so as to be attached to one end of the **carbon foam electrode**. The plate may be fixed to the **electrode** by crimping or a similar deforming process or may be fitted thereto by an elec. conductive adhesive.

ACCESSION NUMBER: 2000:191393 CAPLUS
DOCUMENT NUMBER: 132:224812
TITLE: Lithium ion battery utilizing **carbon foam electrodes**
INVENTOR(S): Moore, Thomas Sidney; Dinda, Subimal
PATENT ASSIGNEE(S): Daimlerchrysler Intellectual Capital Corp., USA
SOURCE: PCT Int. Appl., 26 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | | DATE |
|---|---|---|---|---|---|
| WO 2000016418 | A1 | 20000323 | WO 1999-US20918 | | 19990910 |
| W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | | | |
| RW: GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG | | | | | |
| AU 9963875 | A1 | 20000403 | AU 1999-63875 | | 19990910 |
| TW 434935 | B | 20010516 | TW 1999-88115765 | | 19991206 |
| US 6605390 | B1 | 20030812 | US 2001-786923 | | 20010808 |
| PRIORITY APPLN. INFO.: | | | US 1998-99924P | P | 19980911 |
| | | | WO 1999-US20918 | W | 19990910 |

REFERENCE COUNT: 2 THERE ARE 2 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 20 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN

AB The large-scale com. synthesis of conducting polymers was to date achieved via a chemical synthesis route. An alternate method for the synthesis of these materials is by using electropolymn. This approach has the

advantages of being able to control the final product conductivity via either the incorporation of different dopant materials and/or controlling the level of polymer oxidation at synthesis. The major problem with the electrochem. approach is the final product has no post synthesis processability. Flow cells utilizing three-dimensional reticulated vitreous **carbon foam electrodes** are discussed. The authors are developing an electrochem. flow cell system that is capable of producing water soluble or dispersible conducting polymers on a com. scale.

ACCESSION NUMBER: 1998:673016 CAPLUS
DOCUMENT NUMBER: 130:44585
TITLE: Development of electrohydrodynamic flow cells for the synthesis of conducting polymers
AUTHOR(S): Innis, P. C.; Aboutanos, V.; Barisci, N.; Moulton, S.; Wallace, G. G.
CORPORATE SOURCE: Intelligent Polymer Research Institute, University of Wollongong, Wollongong, 2522, Australia
SOURCE: Annual Technical Conference - Society of Plastics Engineers (1998), 56th(Vol. 2), 1308-1312
CODEN: ACPED4; ISSN: 0272-5223
PUBLISHER: Society of Plastics Engineers
DOCUMENT TYPE: Journal
LANGUAGE: English
REFERENCE COUNT: 40 THERE ARE 40 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 21 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB In this project, the development and testing of novel carbon materials for the electrochem. removal of heavy metal ions from aqueous wastes have been carried out. Both electroplating and electrosorption were employed by using a "packed bed" of the carbon material in a "flow-through" electrochem. remediation cell. The main focus of this work was to develop and test a cathodic material with a large ratio of surface area to volume To this end, a packed bed of conductive carbon, either as carbon fibers or as **carbon foams**, was utilized. The increased surface area helps minimize the length of **electrode** through which the solution must pass. This decreased distance leads to reduced resistance to solution flow. The removal of cadmium, lead, copper, and nickel from aqueous samples using a small-scale electrolytic cell has been demonstrated. Removal efficiencies above 90% have been observed Continuous removal of lead over a 72 h period was demonstrated at these levels. An effluent concentration below 10 ppm was observed for an inlet solution feed of 100 ppm. The use of electrolytic remediation on waste streams proved successful for the selective removal and recovery of metals. The removal of nickel ions from solution directly onto the bare carbon material was inefficient. By plating a small amount of copper onto the carbon surface prior to use, enhanced removal was obtained. At pH 7.0, a removal efficiency for nickel of 89% was achieved.

ACCESSION NUMBER: 1997:195331 CAPLUS
DOCUMENT NUMBER: 126:176124
TITLE: Environmental Pollution Control Devices Based on Novel Forms of Carbon: Heavy Metals
AUTHOR(S): Brennsteiner, Albert; Zondlo, John W.; Stiller, Alfred H.; Stansberry, Peter G.; Tian, Dacheng; Xu, Yue
CORPORATE SOURCE: Department of Chemical Engineering, West Virginia University, Morgantown, WV, 26506, USA
SOURCE: Energy & Fuels (1997), 11(2), 348-353
CODEN: ENFUEM; ISSN: 0887-0624
PUBLISHER: American Chemical Society
DOCUMENT TYPE: Journal
LANGUAGE: English
REFERENCE COUNT: 21 THERE ARE 21 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 22 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB **Carbon foams** have been finding many applications in recent years. Some applications include: fuel cell electrocatalysts, general catalyst supports, porous adsorbents, and foam **electrodes** for use in batteries and capacitors. Preparation of these **carbon**

**foams** is equally diverse, depending on the desired pore sizes and densities required. Current methods for the production of **carbon foams** are: graphitic **carbon foams** produced from anisotropic pitch, low d. replica **carbon foams**, highly porous carbonized polyacrylonitrile foams, and carbonization of resorcinol-formaldehyde aerogels. A series of rigid hypercrosslinked foams have been prepared using simple rigid polyarom. hydrocarbons such as benzene, biphenyl, m-terphenyl, diphenylmethane, and polystyrene, with p-dichloroxylene as the crosslinking agent. After drying the gels, the resulting foams are robust and rigid. Their densities range from 0.3g/cc to 0.5g/cc. An investigation of the carbonization of hypercrosslinked foams will be described here.

ACCESSION NUMBER: 1996:416123 CAPLUS
TITLE: Carbon foams prepared from hypercrosslinked polymer foams
AUTHOR(S): Steckle, W. P. Jr.
CORPORATE SOURCE: Los Alamos National Lab, Los Alamos, NM, 87455, USA
SOURCE: Book of Abstracts, 212th ACS National Meeting, Orlando, FL, August 25-29 (1996), POLY-356. American Chemical Society: Washington, D. C.
CODEN: 63BFAF
DOCUMENT TYPE: Conference; Meeting Abstract
LANGUAGE: English

L2 ANSWER 23 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN

AB The **electrode** separator for electrochem. energy storage devices, such as a high energy d. double-layered capacitor or battery with **carbon foam electrodes**, is derived from an aquagel (aerogel, xerogel) of resorcinol-formaldehyde and related polymers and contains ionically conducting electrolyte in the pores.

ACCESSION NUMBER: 1995:594559 CAPLUS
DOCUMENT NUMBER: 123:13766
TITLE: Aquagel electrode separator for use in batteries and supercapacitors
INVENTOR(S): Mayer, Steven T.; Kaschmitter, James L.; Pekala, Richard W.
PATENT ASSIGNEE(S): University of California, USA
SOURCE: U.S., 13 pp. Cont.-in-part of U.S. 5,260,855.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| US 5402306 | A | 19950328 | US 1993-57739 | 19930504 |
| US 5260855 | A | 19931109 | US 1992-822438 | 19920117 |
| US 5529971 | A | 19960625 | US 1993-36740 | 19930325 |
| US 5789338 | A | 19980804 | US 1996-619393 | 19960320 |
| PRIORITY APPLN. INFO.: | | | US 1992-822438 | A2 19920117 |
| | | | US 1993-36740 | A3 19930325 |

L2 ANSWER 24 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN

AB Mass transport to rotating cylinder **electrodes** (radius 0.5 cm and height 1.2 cm) fabricated from reticulated vitreous carbon (RVCRCE) was studied using linear sweep voltammetry in a 0.5M Na2SO4 + 1mM CuSO4 electrolyte at pH 2. At a fixed cupric ion concentration the limiting current is dependent upon velocity to the power 0.55 to 0.71 depending upon the porosity grade of the **carbon foam**. The product of mass transport coefficient and specific **electrode** area, kmAe, is .apprx.0.51 s-1 at 157 rad s-1 (corresponding to 1500 rpm) for the 100 ppi material. The exptl. data are compared to the predicted performance of a hydrodynamically smooth rotating disk **electrode** (RDE) and rotating cylinder **electrode** (RCE).

ACCESSION NUMBER: 1995:576091 CAPLUS
DOCUMENT NUMBER: 122:324770
TITLE: Mass transport to reticulated vitreous carbon rotating

cylinder electrodes
AUTHOR(S): Nahle, A. H.; Reade, G. W.; Walsh, F. C.
CORPORATE SOURCE: Sch. Chemistry, Univ. Portsmouth, Portsmouth, PO1 2DT, UK
SOURCE: Journal of Applied Electrochemistry (1995), 25(5), 450-5
CODEN: JAELBJ; ISSN: 0021-891X
PUBLISHER: Chapman & Hall
DOCUMENT TYPE: Journal
LANGUAGE: English

L2 ANSWER 25 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB Thin, flat C electrodes are fabricated by infiltrating highly porous C papers, membranes, felts, metal fibers or powders, or fabrics with a C foam precursor material. The infiltrated C paper, for example, is then cured to form a gel-saturated C paper, which is subsequently dried and pyrolyzed to form a thin sheet of porous carbon. Precursor materials include polyacrylonitrile (PAN), polymethylacrylonitrile (PMAN), resorcinol/formaldehyde, catechol/formaldehyde, phenol/formaldehyde, or their mixts. These thin films are ideal for use as high power and energy electrodes in batteries, capacitors, and fuel cells, and are potentially useful for capacitive deionization, filtration and catalysis.
ACCESSION NUMBER: 1995:541432 CAPLUS
DOCUMENT NUMBER: 122:269435
TITLE: Method for making thin **carbon foam electrodes**
INVENTOR(S): Pekala, Richard W.; Mayer, Steven T.; Kaschmitter, James L.; Morrison, Robert L.
PATENT ASSIGNEE(S): University of California, USA
SOURCE: PCT Int. Appl., 12 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| WO 9506002 | A1 | 19950302 | WO 1994-US9547 | 19940823 |
| W: CA, JP | | | | |
| RW: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE | | | | |
| US 5932185 | A | 19990803 | US 1993-110003 | 19930823 |
| PRIORITY APPLN. INFO.: | | | US 1993-110003 A | 19930823 |

L2 ANSWER 26 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB Unique types of **carbon foams**, developed at Lawrence Livermore National Laboratory, were used to make an "Aerocapacitor.". The aerocapacitor is a high power-d., high energy-d., electrochem. double-layer capacitor which uses carbon aerogels as **electrodes**. These **electrodes** possess very high surface area per unit volume and are elec. continuous in both the carbon and electrolyte phase on a 10 nm scale. Aerogel surface areas range from 100 to 700 m2/cm3 (as measured by BET anal.), with bulk densities of 0.3-1.0 g/cm3. This morphol. permits stored energy to be released rapidly, resulting in high power densities (7.5 kW/kg). Materials parameterization was performed, and device capacitances of several tens of Farads per g and per cm3 of aerogel were achieved.
ACCESSION NUMBER: 1993:150925 CAPLUS
DOCUMENT NUMBER: 118:150925
TITLE: The aerocapacitor: an electrochemical double-layer energy-storage device
AUTHOR(S): Mayer, S. T.; Pekala, R. W.; Kaschmitter, J. L.
CORPORATE SOURCE: Lawrence Livermore Natl. Lab., Livermore, CA, 94550, USA
SOURCE: Journal of the Electrochemical Society (1993), 140(2), 446-51
CODEN: JESOAN; ISSN: 0013-4651
DOCUMENT TYPE: Journal

LANGUAGE: English

L2 ANSWER 27 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB The advantages and characteristics of mercury-coated **carbon-foam** composite **electrodes** for stripping anal. for trace metals are described. The enhanced perimeter-to-area ratios characterizing these composite surfaces offer high preconcn. efficiencies from quiescent solns. Addnl. advantages accrue from the lower oxygen-reduction and mercury-oxidation background-current components. Scanning-tunneling and scanning electron microscopies offer valuable insights into the unique microstructure of the mercury film and substrate. Exploratory expts. have shown the dependence of the stripping response upon numerous exptl. variables. Convenient quantitation of lead in drinking water is accomplished with quiescent solution and short deposition period. Since neither stirring nor deoxygenation is required, composite-based stripping **electrodes** should be valuable for field and remote operations.
ACCESSION NUMBER: 1992:33500 CAPLUS
DOCUMENT NUMBER: 116:33500
TITLE: Mercury-coated **carbon-foam** composite **electrodes** for stripping analysis for trace metals
AUTHOR(S): Wang, Joseph; Brennsteiner, Albert; Angnes, Lucio; Sylwester, Alan; LaGasse, Robert R.; Bitsch, Nils
CORPORATE SOURCE: Dep. Chem., New Mexico State Univ., Las Cruces, NM, 88003, USA
SOURCE: Analytical Chemistry (1992), 64(2), 151-5
CODEN: ANCHAM; ISSN: 0003-2700
DOCUMENT TYPE: Journal
LANGUAGE: English

L2 ANSWER 28 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB The construction of a microcellular C foam/epoxy resin composite electrode is described. The large perimeter-to-area ratio (P/A) of the resulting microelectrode array is desirable and represents an improvement in P/A over that of many composites presently in use. The array is characterized by using chronoamperometry and cyclic voltammetry. The results are compared to those of both a glassy carbon electrode and microelectrode array theory. The response obtained are representative of expected behavior. The capacitance of the electrode was 2.1 + 103 μF/cm2, 2 orders of magnitude greater than that expected for C.
ACCESSION NUMBER: 1990:206497 CAPLUS
DOCUMENT NUMBER: 112:206497
TITLE: Electrochemical characterization of a microcellular **carbon foam**/epoxy composite **electrode**
AUTHOR(S): Davis, Brian K.; Weber, Stephen G.; Sylwester, Alan P.
CORPORATE SOURCE: Dep. Chem., Univ. Pittsburgh, Pittsburgh, PA, 15260, USA
SOURCE: Analytical Chemistry (1990), 62(10), 1000-3
CODEN: ANCHAM; ISSN: 0003-2700
DOCUMENT TYPE: Journal
LANGUAGE: English

L2 ANSWER 29 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB The electrochem. behavior and anal. utility of a new C composite, consisting of an open-celled carbonized polyacrylonitrile (PAN) foam, filled with an insulating polymer are described. The material offers advantageous structural properties and controlled processing that lead to enhanced diffusional flux and steady-state currents at moderate times. In particular, the small and isolated active sites make this composite more immune to effects of overlapping diffusion zones (between such sites). Expts. evaluating the microarray properties, including cyclic voltammetry and chronoamperometry, indicate that the response is in agreement with predictions of established theory. Linear sweep voltammetry and amperometric flow detection are used to illustrate the anal. utility. The attractive properties of PAN-derived carbons should benefit many areas of electrochem.

ACCESSION NUMBER: 1990:206496 CAPLUS
DOCUMENT NUMBER: 112:206496
TITLE: Composite electrodes based on carbonized poly(acrylonitrile) foams
AUTHOR(S): Wang, Joseph; Brennsteiner, Albert; Sylwester, Alan P.
CORPORATE SOURCE: Dep. Chem., New Mexico State Univ., Las Cruces, NM, 88003, USA
SOURCE: Analytical Chemistry (1990), 62(10), 1102-4
CODEN: ANCHAM; ISSN: 0003-2700
DOCUMENT TYPE: Journal
LANGUAGE: English

L2 ANSWER 30 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB A method is described for preparing a low-d., open-celled, microcellular C foam. The method consists of dissolving a carbonizable polymer or copolymer in a solvent, pouring the solution into a mold, cooling the solution, removing the solvent, and carbonizing the polymer or copolymer in a high-temperature oven to produce the foam. An additive can be added to produce a doped C foam, and isotropic foams can be made by selection of a suitable solvent. The low-d., microcellular foams are particularly useful in the fabrication of inertial confinement fusion targets, and can also be used as catalysts, absorbents, and electrodes. Thus, a crystalline non-volatile organic compound such as Pd acetylacetonate (0.01-2 weight%) is added to a 3 weight% solution of polyacrylonitrile (PAN, mol. weight 150,000) in 80:20 Me sulfone-cyclohexanol solvent at 160°. After dissoln., the solution is poured into a mold and quenched to 25°. This results in thermally-induced phase separation of PAN followed by solidification. Removal of the solvent by sublimation (at 50-85°) under vacuum (<1 torr) results in doped PAN foams of low initial d. Carbonization of the foam is achieved by slow heating (5°/min) to 600-1200° under a continuous flow of Ar. The d. of the resulting foam is 50-70 mg/mL.
ACCESSION NUMBER: 1989:517737 CAPLUS
DOCUMENT NUMBER: 111:117737
TITLE: Preparation of low-density microcellular carbon foams
INVENTOR(S): Arnold, Charles, Jr.; Aubert, James H.; Clough, Roger L.; Rand, Peter B.; Sylwester, Alan P.
PATENT ASSIGNEE(S): United States Dept. of Energy, USA
SOURCE: U.S., 5 pp.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| US 4832881 | A | 19890523 | US 1988-209168 | 19880620 |
| US 209168 | A0 | 19891101 | | |
| PRIORITY APPLN. INFO.: | | | US 1988-209168 | 19880620 |

L2 ANSWER 31 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB C foams prepared by pyrolysis of phenol-formaldehyde resins (activated with tensides) in C filling (grains <2 mm) at regulated temperature are used as heat insulating material, for elec. heating parts or as electrode material. Thus, phenol-formaldehyde resin (13% Me groups) 100, surfactant composition (prepared by addition of 17 mol ethylene oxide/mol ricinoleic acid glyceride) 0.3, aliphatic hydrocarbons (distilled at 30-100°) 4.4 and catalyst (prepared from phenol and H2SO4) 6.4 were mixed at 39°, foamed, and hardened at 65° to give after cooling a foam which was cut and burned to 1000° with graphite (size <2 mm) or powder coke at regulated temperature to give a C foam having spec. weight 0.0563 g/cm3, crushing strength 2MPa, elec. resistivity 700 μΩ-m, pores 0.05-0.3 mm, ash 2.7%, and thermal conductivity 0.11 W/mK. Prepared foam burned at 2500° at regulated temperature had spec. weight 0.058 g/cm3, crushing strength 1 MPa, elec. resistivity 400 μΩ-m, pores 0.05-0.3 mm, and ash 0.3%.
ACCESSION NUMBER: 1987:181555 CAPLUS
DOCUMENT NUMBER: 106:181555
TITLE: Manufacture of carbon foam material

INVENTOR(S): Sasak, Stanislav
PATENT ASSIGNEE(S): Czech.
SOURCE: Czech., 3 pp.
CODEN: CZXXA9
DOCUMENT TYPE: Patent
LANGUAGE: Slovak
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| CS 231762 | B1 | 19841214 | CS 1982-81 | 19820105 |
| PRIORITY APPLN. INFO.: | | | CS 1982-81 | 19820105 |

L2 ANSWER 32 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB In order to achieve uniform Zn deposition in electroplating and for Zn cells, an electrode is described which includes a current collector and a porous conducting substrate with the elec. resistance of the conducting substrate varied generally by a shaped structure resulting in low and high elec. resistance portions. Thus, an electrode was formed from a Cu foil current collector and a porous conducting substrate of C foam in elec. contact with the porous substrate having an upper portion of thickness .apprx.5 mm with low resistance and tapered to a thickness of .apprx.1 mm and high elec. resistance. Thus a porous substrate was the neg. terminal for Zn electroplating at 10 mA/cm2 with a Zn foil 2nd electrode and a bath of ZnBr2 28.6, KBr 14.3, and NaCl 14.3%. After 16 h electrolysis, a more uniform Zn electroplate was obtained than would have been obtained using a conventional electrode.
ACCESSION NUMBER: 1979:94477 CAPLUS
DOCUMENT NUMBER: 90:94477
TITLE: Electrode with a graded electrical resistance substrate
INVENTOR(S): Will, Fritz G.
PATENT ASSIGNEE(S): General Electric Co., USA
SOURCE: U.S., 4 pp.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| US 4133738 | A | 19790109 | US 1977-816480 | 19770718 |
| PRIORITY APPLN. INFO.: | | | US 1977-816480 A | 19770718 |

L2 ANSWER 33 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB A study of the effect of LiF on electrolyte temperature and of the addition of C particles to the melt has indicated that increasing the Al metal content and increasing the LiF content leads to lowering the melt temperature Increasing the LiF content by 1% lowers the melt temperature by 7.8°. Increasing the C content in the electrolyte lowers the elec. conductivity by 11.
ACCESSION NUMBER: 1972:534289 CAPLUS
DOCUMENT NUMBER: 77:134289
TITLE: Effect of lithium fluoride on electrolyte temperature and carbon foam content during electrolysis of aluminum
AUTHOR(S): Kulikov, Yu. V.
CORPORATE SOURCE: USSR
SOURCE: Tsvetnye Metally (Moscow, Russian Federation) (1972), (8), 32-4
CODEN: TVMTAX; ISSN: 0372-2929
DOCUMENT TYPE: Journal
LANGUAGE: Russian

L2 ANSWER 34 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB Pyrolysis of a normal coal tar pitch fraction gave a material containing hollow spheres with a single broad statistical distribution maximum at a

compressive strength of 50 g and a maximum compressive strength of 150 g, whereas the material from an **electrode** pitch fraction contained spheres with sharp maximum at 10 and 20 g and a maximum compressive strength of 80 g. These materials had higher thermal conds. at 20° than com. carbon felt or **carbon foam**.

ACCESSION NUMBER: 1971:150439 CAPLUS
DOCUMENT NUMBER: 74:150439
TITLE: Formation of hollow spheres by the pyrolysis of resin fractions extracted from coal tar pitches
AUTHOR(S): Huettinger, Klaus J.
CORPORATE SOURCE: Inst. Chem., Tech. Univ., Karlsruhe, Fed. Rep. Ger.
SOURCE: Carbon (1971), 9(2), 222-3
CODEN: CRBNAH; ISSN: 0008-6223
DOCUMENT TYPE: Journal
LANGUAGE: English

L2 ANSWER 35 OF 35 CAPLUS COPYRIGHT 2005 ACS on STN
AB A plastic foam (e.g., a polyurethane foam) which can be graphitized by heating is impregnated with a resin (e.g., a phenolic resin) which is transformed into glassy carbon on heating; the mixture is dried, cured, and carbonized to give a lightwt. **carbon foam** with cell walls consisting of graphite coated with glassy carbon. These composite foams have lower sp. weight than pure glassy **carbon foams**, are strong and hard, and are useful as temperature-corrosion-, and oxidation-resistant thermal insulation, fuel cell **electrodes**, and corrosion-resistant filters.

ACCESSION NUMBER: 1970:456898 CAPLUS
DOCUMENT NUMBER: 73:56898
TITLE: Lightweight carbon foam material from resin foams
PATENT ASSIGNEE(S): N. V. Philips' Gloeilampenfabrieken
SOURCE: Neth. Appl., 8 pp.
CODEN: NAXXAN
DOCUMENT TYPE: Patent
LANGUAGE: Dutch
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| NL 6815254 | | 19700428 | NL | 19681025 |

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(FILE 'HOME' ENTERED AT 10:22:45 ON 07 SEP 2005)

FILE 'CAPLUS' ENTERED AT 10:22:55 ON 07 SEP 2005
L1 384 S CARBON FOAM
L2 35 S L1 (P) ((CURRENT COLLECTOR) OR ELECTRODE)